

What is claimed is:

1. An isolated nucleic acid molecule selected from the group consisting of:
 - (a) a nucleic acid molecule at least 50 nucleotides in length that hybridizes with a nucleic acid molecule having a nucleic acid sequence selected from the group consisting of SEQ ID NO:32, SEQ ID NO:35, SEQ ID NO:38 and SEQ ID NO:41, under conditions comprising: (1) hybridizing in a solution comprising 2X SSC in the absence of nucleic acid helix destabilizing compounds, at a temperature of 37°C; and (2) washing in a solution comprising 1X SSC in the absence of helix destabilizing compounds, at a temperature of 66.8°C; wherein said at least 50 nucleotide nucleic acid molecule encodes a protein that binds to octopamine; and
 - (b) a nucleic acid molecule fully complementary to the nucleic acid molecule of (a).
2. An isolated nucleic acid molecule selected from the group consisting of:
 - (a) a nucleic acid molecule at least 35 nucleotides in length that hybridizes with a nucleic acid molecule having a nucleic acid sequence selected from the group consisting of SEQ ID NO:2, SEQ ID NO:5, SEQ ID NO:8 and SEQ ID NO:13, under conditions comprising: (1) hybridizing in a solution comprising 2X SSC in the absence of nucleic acid helix destabilizing compounds, at a temperature of 37°C; and (2) washing in a solution comprising 1X SSC in the absence of helix destabilizing compounds, at a temperature of 74.6°C; wherein said at least 35 nucleotide nucleic acid molecule encodes a protein that binds to octopamine; and
 - (b) a nucleic acid molecule fully complementary to the nucleic acid molecule of (a).

3. An isolated nucleic acid molecule selected from the group consisting of:

- (a) a nucleic acid molecule having a nucleic acid sequence selected from the group consisting of SEQ ID NO:30, SEQ ID NO:33, SEQ ID NO:36 and SEQ ID NO:39, and variants thereof at least 95% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NO:30, SEQ ID NO:33, SEQ ID NO:36 and SEQ ID NO:39, wherein said nucleic acid molecule encodes a protein that binds to octopamine;
- (b) a nucleic acid molecule comprising a fragment of a nucleic acid molecule of (a), wherein said fragment is at least 50 nucleotides in length; and
- (c) a nucleic acid molecule fully complementary to a nucleic acid molecule of (a) or (b).

4. An isolated nucleic acid molecule selected from the group consisting of:

- (a) a nucleic acid molecule having a nucleic acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:6 and SEQ ID NO:11, and variants thereof at least 95% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:6 and SEQ ID NO:11, wherein said nucleic acid molecule encodes a protein that binds to octopamine;

- (b) a nucleic acid molecule comprising a fragment of a nucleic acid molecule of (a), wherein said fragment is at least 35 nucleotides in length; and
- (c) a nucleic acid molecule fully complementary to a nucleic acid molecule of (a) or (b).

5. An isolated protein comprising an amino acid sequence selected from the group consisting of SEQ ID NO:31, SEQ ID NO:34, SEQ ID NO:37 and SEQ ID NO:40, and variants thereof that are at least 95% identical to an amino acid sequence selected from the group consisting of SEQ ID NO:31, SEQ ID NO:34, SEQ ID NO:37 and SEQ ID NO:40, wherein said protein variant binds to octopamine.

6. An isolated protein comprising an amino acid sequence selected from the group consisting of SEQ ID NO:4, SEQ ID NO:7 and SEQ ID NO:12, and variants thereof that are at least 95% identical to an amino acid sequence selected from the group consisting of SEQ ID NO:4, SEQ ID NO:7 and SEQ ID NO:12, 10 wherein said protein variant binds to octopamine.

7. A method to produce a protein encoded by an isolated nucleic acid molecule of any of Claims 1-4, said method comprising culturing a cell transformed with a nucleic acid molecule encoding said protein.

8. A recombinant molecule comprising a nucleic acid molecule as set forth in Claims 1-4 operatively linked to a transcription control sequence.

9. A recombinant virus comprising a nucleic acid molecule as set forth in Claim 1-4.

10. A recombinant cell comprising a nucleic acid molecule as set forth in Claims 1-4.

20 11. The nucleic acid molecule of Claims 1 and 3, wherein said nucleic acid molecule comprises a nucleic acid sequence selected from the group consisting of SEQ ID NO:30, SEQ ID NO:33, SEQ ID NO:36, and SEQ ID NO:39.

12. The nucleic acid molecule of Claims 2 and 4, wherein said nucleic acid molecule comprises a nucleic acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:6 and SEQ ID NO:11.

13. The nucleic acid molecule of Claims 1 and 3, wherein said nucleic acid molecule encodes a protein comprising an amino acid sequence selected from the group consisting of SEQ ID NO:31, SEQ ID NO:34, SEQ ID NO:37 and SEQ ID NO:40.

5 14. The nucleic acid molecule of Claims 2 and 4, wherein said nucleic acid molecule encodes a protein comprising an amino acid sequence selected from the group consisting of SEQ ID NO:4, SEQ ID NO:7 and SEQ ID NO:12.

15. A method to detect an inhibitor of tick octopamine receptor activity, said method comprising (a) contacting an isolated tick octopamine receptor protein of 10 Claim 5 or 6, with a putative inhibitory compound under conditions in which, in the absence of said compound, said protein has tick octopamine receptor protein activity, and (b) determining if said putative inhibitory compound inhibits tick octopamine receptor protein activity.

16. An isolated antibody that selectively binds to a protein as set forth in 15 Claim 5 or 6.

17. The protein of Claim 5, wherein said protein is encoded by a nucleic acid molecule having a nucleic acid sequence selected from the group consisting of: SEQ ID NO:30, SEQ ID NO:33, SEQ ID NO:36 and SEQ ID NO:39.

18. The protein of Claim 5, wherein said protein comprises an amino acid 20 sequence selected from the group consisting of SEQ ID NO:31, SEQ ID NO:34, SEQ ID NO:37 and SEQ ID NO:40.

19. The protein of Claim 6, wherein said protein is encoded by a nucleic acid molecule having a nucleic acid sequence selected from the group consisting of: SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:6 and SEQ ID NO:11.

20. The protein of Claim 6, wherein said protein comprises an amino acid sequence selected from the group consisting of: SEQ ID NO:4, SEQ ID NO:7 and SEQ ID NO:12.